SPECIAL REPORT

ON THE

COAL-FIELD OF LITTLE SEQUATCHEE

WITH A GENERAL DESCRIPTION OF THE

CUMBERLAND TABLE-LAND.

By J. B. KILLEBREW,

Commissioner of Agriculture, Statistics and Mines.

NASHVILLE:

TAVEL, EASTMAN & HOWELL.

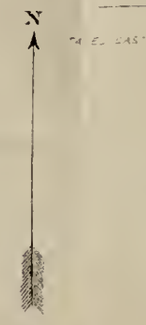
1876.

MAP OF THE LITTLE SEQUATCHEE COAL FIELDS TENNESSEE.

FOR THE BUREAU OF AGRICULTURE, STATISTICS AND MINES.

J. B. KILLEBREW Com.r.

Scale 4 miles to 1 inch.



BALTAMONT

GREAT PINE FOREST

GRUETLI
Swiss Colony.

Chattanooga Road

Richards

Coal

Possum Ube Banks

Chestnut Ridge

Coal

Coal 12 feet

Holly Branch

Holly Water

Sewanee

Mill Cr.

Pryor Coal

Greens

Barnley Coal 9 feet

Coal

Poor Fork

Kellys Coal

Caldwell

Stone Coal

Griffiths Cr.

UPPER COAL MEASURES

VICTORIA

ENGLISH COMPANY

Fire Brick Clay

Proposed R.R. to Dunlap

VALLEY

Paynes Cove

Coal

TRACY CITY

Tracy Road

MOFFAT

Rowarks Cove

Coal

UNIVERSITY OF THE SOUTH

Rail Road

Tennessee Coal and

Talleys Cove

Lemon Point

Jones Cove

Little Grizzard

Big Grizzard

Indian

Coal

FOSTER'S MILL

Copenhagen Cove

SEQUATCHEE

Lost Cove Coal

Nashville and Chattanooga R.R.

Big Fiery Gizzard Coal

Battle

Staniffers Cove

River Mills

Sequatchee River

Hodges Mill

Proposed R.R.

Proposed

Preston Iron Ore Deposit extends 70 miles.

JASPER

Big

RIVER

COAL

Sweetens Cove

COAL

Creek

Branch

Sorrels Mill

TENNESSEE

BATTLE CREEK MINES.

Jasper

Nashville and Chattanooga Rail Road

STATE LINE

ALABAMA

GEORGIA

SPECIAL REPORT

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WITH A

General Description of the Cumberland Table-land.

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To His Excellency, Gov. Jas. D. Porter :

I herewith submit one of a series of papers on the coal-field of Tennessee. This will be followed by others as rapidly as they can be prepared with accuracy. It is a striking fact, and one that is by no means creditable to the enterprise or appreciation of our citizens, that while the coal-bearing lands of Pennsylvania well situated as to transportation, will bring in the market from $100 to $1000 per acre, lands equally as productive in coal may be bought in our State at prices ranging from one dollar to twenty dollars per acre, depending upon the quality of the coal, improvements made, and accessibility to market. Many of these coal-fields lie contiguous to deposits of iron as rich and as exhaustless as may be found upon the continent. Can nothing be done to bring Tennessee to the front in these departments of industry—the mining of coal and the making of iron? Surely here is a field which, when occupied, will do much to relieve our people from the burden of taxation that presses with increasing weight each year. The early development of our mineral wealth will diminish taxation, stimulate enterprise and increase production in every department of human industry. The measure of wealth and civilization is the production of coal and the use of iron. As long, therefore, as civilization exists there will be a growing demand for these two articles so abundant in our State. Financial depression and consequent business stagnation may curtail this demand for a time, but the quantity required after such periods of stagnation is always greater than before such periods began. No time is more opportune than the present for reaching the ear of the iron

masters. They are looking throughout the domain of civilization for places where iron can be made cheapest. Our boast has been that we can, with sufficient capital, make it at a profit without the tariff, and may even ship without loss the products of our furnaces to England. If this be so, no effort should be spared to bring this fact before the minds of iron men.

Cheap iron depends upon cheap fuel. The very fact that our richest coal-lands may be bought at a nominal price is a virtual guarantee of cheap fuel. The proximity of this fuel to rich iron ores gives the State the double advantage of cheap fuel and cheap ore. I am happy to be able to state that many capitalists of the North and Europe have manifested their interest in our coal and iron-fields, and are ardently seeking for information on these subjects. To supply this information, in part, is the leading object of this, and will be of the succeeding pamphlets.

Respectfully submitted,

J. B. KILLEBREW.

June 6, 1876.

LITTLE SEQUATCHEE COAL-FIELD.

The primary object of this paper is to give a specific account of all that portion of the coal-field drained by the Little Sequatchee river, including the Tracy City Mines. It is important, however, to a proper understanding to give a general description of the physical aspects and aptitudes of the entire

COAL FIELD OF TENNESSEE.

This is included in the great Appalachian coal-field of the United States, which extends from Pennsylvania to Alabama, and comprises 80,000 square miles, 60,000 of which will furnish available coal. Its area in Tennnessee is 5,100 square miles, which area includes the whole of the Cumberland Table-land. This division of the State forms an irregular quadrilateral, having the northern and southern boundaries nearly parallel, the former being about 71 miles long, and the latter or southern boundary being about 50 miles in length. The other two sides run diagonally through the State in a northeasterly and southwesterly direction. A central longitudinal line would bear about north 20° east.

This region has, for the most part, a flat top composed of conglomerate sandstone, or pudding stone, which forms the general surface. The thickness of this conglomerate varies from 20 to 150 feet, the average probably being near 70 feet. On the edges of the Table-land it forms a bold line of steep cliffs almost inaccessible, except where it has been

cut through by streams, or crumbled down by erosion. At the foot of this bold, and oftentimes over-hanging, brow the sides of the mountain take a general slope to the low-lands below. These slopes are covered with a dense growth of excellent timber, and the soil, though difficult to cultivate by reason of the steepness of the sides, is of great fertility. The western edge of the Tennessee coal-field is very irregularly lined, being jagged and scalloped by numerous coves and ravines with outlying knobs, separated by gorges or fissures from the main Table-land. The eastern outline is nearly a straight line, bulging out, however, in one place so as to take in parts of Roane, Anderson and Campbell counties. The southern half of the Table-land is cleft by a fissure from 800 to 1000 feet deep, which reveals all the geological formations from the Upper Silurian to the Upper Coal Measures. Through this the Big Sequatchee River flows. By this almost perpendicular fissure the southern half of the Tennessee coal-field is divided into two distinct arms. The eastern arm is about twelve miles wide and seventy miles long, and is known as Walden's Ridge. The western arm has an average width of thirty-five miles. The two arms unite above the head of Sequatchee Valley. The lower half of the western arm contains the Little Sequatchee coal region, which we propose to describe.

The average heighth of the Cumberland Table-land is about 2000 feet above the level of the sea, but at places it rises to a much greater altitude. In the northeastern part where its plateau character is to a great extent lost, there are some peaks that attain an elevation of over 3000 feet. Crsos Mountain, opposite Jacksboro, has an altitude of 3370 feet, and the mountain at Coal Creek, in Anderson county, attains even a greater height. Looking at the Table-land from the valley of East Tennessee it stands out with singular boldness and sharpness of outline, like a huge fortification, difficult to scale and impossible to demolish.

It forms, indeed, the chief barrier to intercourse between the people of East and Middle Tennessee, and it was found impracticable twenty years ago to construct a railway line running east and west through the State. Skillful engineering, however, has been able to overcome this natural obstacle to the course of the locomotive engine. Some account of the geological character of this Table-land is also necessary in order to give the reader a clear idea of the extent of our coal deposits.

First swelling up from the low-lands, and forming the massive foundation of the Table-land, is the Mountain limestone which has an average thickness of about 500 feet. This limestone is of different shades of color and varied character as to weathering qualities. Here may be seen the blue, the buff, the gray. Some beds are thin and flaggy, some heavy, others of moderate thickness. Some are crinoidal, some oolitic, and some argillaceous. The latter breaks with a conchoidal fracture, is very fine grained, and has been used for lithographic purposes. It also makes a good hydraulic cement. Some of the interstratified sandstones make excellent flags. In White and Bledsoe counties, these flags are very abundant as well as of excellent quality. Among the limestones and sandstones of the Mountain is found very superior building stone. Much of the limestone is sufficiently fine grained for the carver's work. The upper layers of sandstone display a beautiful variegated and laminated appearance. This stone works with ease, and makes both a handsome and durable building. When first quarried it is soft, but it becomes very hard by exposure.

LOWER COAL MEASURES.

Between the Monntain limestone and the top of the main conglomerate which forms the general surface of the Table-land, there is a series of strata composed of shales, sandstones, fire-clay and coal. The average thickness of this

series, including the conglomerate rock, is about 400 feet, thinning out in some of the counties to 200 or less. This series constitutes the Lower Coal Measures. There are usually three well defined seams of coal in the Lower Coal Measures:

1. *The Slate Vein.*—This occurs from twenty to sixty feet above the Mountain limestone, and is called the *Slate Vein*, because overlying it is a bed of shale from fifteen to twenty feet thick. A rusty-colored shale often appears beneath. The coal in this seam is from one to three feet thick, and is very hard and lustrous.

2. *The Cliff Vein.*—This lies sixty to eighty feet above the Slate Vein, and is capped by a heavy sandstone, which forms a well defined cliff above the coal. This seam is from one to twelve feet thick; coal hard and much like that of the Slate Vein.

3. *The Sub-conglomerate Vein.*—This is too thin to work at the outcrop, and is important only in showing its wonderful persistency. It is from six inches to two feet thick, affording excellent coal.

These three seams are the only beds of coal that are known to exist in the Lower Coal Measures. One other has been suspected, but there are reasons for believing that it is a drop from the Cliff Vein.

UPPER COAL MEASURES.

Superimposed upon the main or table-covering conglomerate are many billowy ridges composed of sandstone and shales, with several coal seams. In the region around Tracy City there are usually four of these seams, only one of which, the main Sewanee, may be considered valuable. At Coal Creek, in Anderson County, where the Upper Coal Measures reach a much greater thickness, the number of seams is greatly increased. According to Prof. Bradley, there are twenty-one seams at Coal Creek, eight of

which are workable. The seams in the Upper Coal Measures appear to be more uniform in thickness, but the coal usually has not the hardness, nor will it bear transportation so well as that of the Lower Measures.

In the region which we propose to describe in this report there are only four seams in the Upper Coal Measures:

1. Twenty feet above the main conglomerate which divides the Upper from the Lower Coal Measures, the first seam is met with, which is usually from one to two feet thick, sometimes swelling out to a thickness of four feet, with thirty feet of shale above separating it from

2. *The Main Sewanee.* This varies in thickness from two to seven feet, usually about four feet, and is capped by a bed of shale from fifteen to twenty feet thick. Sometimes the sandstone lies immediately above the coal. The quality of this coal is well known, on account of its having been mined more extensively than any other in the State. It is a very pure coal, bituminous, spumous, fragile with contorted laminæ; highly esteemed as a heat generator, being what is called a long-flamed coal. It makes excellent coke, which is used extensively in the manufactnre of pig-iron, and in rolling mills. The greatest and almost the only objection to the coal of this seam is its tendency to slack or disintegrate upon exposure to the atmosphere. At a few of the outcrops of this seam, however, the coal is cubical and of great specific gravity, preserving the purity of the upper seams and the hardness of the lower. Such coal is found at Deakins' Bank, in Sequatchee county, and at Kelly's Bank, in Marion. Both of these banks will be described hereafter.

3d and 4th. Two thin seams of coal 160 and 200 feet above the Main Sewanee. These seams are almost useless, the thickest showing only one foot of good coal.

To summarize: The coal-field is separated by the main conglomerate into the Upper and Lower Coal Measures.

The Lower Measures have three seams of coal, two of which are workable. The Upper Measures in the northeastern part of the coal-field have eight workable seams, and in the southern part only one which is the Main Sewanee.

Before concluding the general view of the Table-land it may be well to give some account of the soil, crops, highland pastures, timber, climate, and other features of general interest.

The soil resulting mainly from the disintegration of sandstone is greatly deficient in calcareous matter. It is thin and porous, and not well adapted to general field crops. There are, however, a few basins in which the soil is moderately productive, and will make satisfactory returns when planted in corn, wheat, tobacco, or other crops suited to the latitude.

The soils everywhere, however, are suited to the growth of Irish potatoes, garden vegetables, grapes and apples. The Irish potatoes are unexcelled by any grown in America. They are not only large, but very mealy, and of a delightful, mild flavor. The average yield is about 100 bushels per acre. The crop is a profitable one, when a market can be reached. What is said of Irish potatoes as to superiority may be affirmed also of cabbage, onions, and other garden vegetables.

In all the State there is no place that will in the least compare with the Table-land in the healthfulness of the apple tree and in the production of the apple. An examination of fifty orchards failed to disclose a single diseased tree. The extreme porosity of the soil permits the roots to take a wide range in search of sustenance, and they do not knot up and become diseased as when planted upon land having a compact sub-soil. Rarely does it happen that the apple crop fails in this region. Thousands of bushels are dried and shipped every year. The apple crop is indeed the chief of all the crops planted upon this mountain.

The apple is, however, finding a rival in the grape. During the past few years thousands of grape vines have been planted, and the yield has in every instance proven satisfactory. About fifty acres are now in vineyards around Tracy City, and so certain is the yield of the grape that its cultivators rely upon it with as much certainty as the coal miners do upon the yield of coal. The pure air of the mountain develops in the grape an unusual amount of saccharine juices, making it not only valuable for the manufacture of wine but highly palatable for table use. The yield is always abundant, and no disease of any kind has attacked the vine, and no insect has ravaged the fruit. In time, this Table-land, with its sandstone soil and swelling ridges, will furnish many Johannisbergs, and the fame of its wine will meet that of the Rhine and contest for supremacy.

But there are other profitable uses to which these lands may be applied. Of all the localities in the State there is none where stock raising can be carried on with such small outlay. The wide expanse of open woods is covered with a luxuriant growth of native grasses and wild peas, upon which cattle feed until they fairly roll in fat. The deliciousness of the mountain-fed beef is proverbial. It brings a high price in market, and always commands a ready sale.

This mountain grass springs up in April, and soon covers the surface with its verdant turf. From this time until November it supplies grazing to thousands of sheep and cattle, and is the chief reliance of many farmers who live in the valleys. No place is more healthy for sheep. They are indeed as healthy as the deer. No disease ever prevails among them, and they, as well as cattle, require but little attention from their owners for eight months in the year, except salting.

Herd's grass and clover, as well as orchard grass, grow well when properly seeded. The hay from these will carry stock through the winter months without any other proven-

der. Indeed, sheep often subsist during the winter upon the ferns and mosses that flourish in unrivalled luxuriance about the elevated swamps that here and there occur upon the Table-land, while the sheltering coves protect them from the wintry blasts or shield them from the ardent rays of a summer's sun. Stock water is everywhere abundant. Springs abound and streams thread the almost level surface in every direction. Wells are dug, and water found all over this mountain at a depth of from ten to twenty feet. The water is soft, limpid, pure, and as good as may be found anywhere on the globe. It is delightfully cool, and is purified by being filtered through sand. Sometimes this sand is ferruginous, then the water is chalybeate. Natural chalybeate springs abound in many places on the Table-land. Many of these springs have attained a national reputation. As summer resorts, the airy heights of the Table-land have no superior. The atmosphere is cool and bracing, and the lassitude so general in the lowlands during summer, gives place to bodily strength and activity upon these mountain heights. Chills and fevers are unknown. Malaria, with its debilitating influences, is dissipated by the breezes that sweep so delightfully over the mountain-top. The warmest nights of August are so cool that blankets are in demand. Consumptives find great relief from the mountain air, and dyspeptics soon acquire the most vigorous appetites and enjoy the grossest food. No cholera has ever visited this region.

While the mountain is healthy, and of great value as grazing grounds; while apples and grapes yield munificently, and garden vegetables, potatoes especially, find here a congenial soil, yet candor compels us to confess that with the exception of a few local areas, the cereals cannot be grown with any profit. By heavy manuring fifteen bushels of wheat have been obtained per acre, but this yield is exceptional.

Nor do peaches thrive. It is almost as difficult to find a healthy peach tree as it is to find an unhealthy apple tree. The climate is too rigorous for the peach—the thermometer through the summer marking a temperature of six or eight and even ten degrees lower than in the central parts of the State. The winters are much colder thongh, owing to the dryness of the soil, the purity of the atmosphere, and the absence of mud, they are not so disagreeable. The air is invigorating, and there is a brightness in the atmosphere surpassing that of an Italian sky.

The honey-bees find here a climate and food suited to their nature. Swarms are found in the forest, and bee-hunting is yet a profitable pastime with many of the inhabitants. Bee-keeping is a growing industry, and honey forms no inconsiderable part of the daily food of the inhabitants. Indeed, this is literally a land flowing with milk and honey, for the abundant highway pasturage is capable of sustaining myriads of herds of cattle, while the flowers that enamel the open woods, and the blooms that fill the air with fragrant ódors, make this an Eden for the honey-bee.

The growths supplying honey are the red maple, wild plum, dogwood, sassafras, dewberry, blackberry, gooseberry, apple, willow, wild cherry, black gum, black locust, poplar*, white clover, holly, linden, persimmon, wild grape, sumac and aster. In addition to these, the open woods in May blush in unseen beauty with almost every description of wild flower, whose nectareous sweets supply material for the most delightful hóney.

The timber of the Table-land is quite variable as to quantity and quality. Usually upon the top the surface is gently undulating, and covered with thin forests of white oak, black oak, chestnut, chestnut oak, and some pines.

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* By poplar, wherever used in this pamphlet, is meant the *lyriodendron tulipifera*, or tulip tree.

Through these woods the eye roams over grasssy stretches o hill and dale, with an occasional laurel or ivy thicket bordering a stream, where the luxuriant wild grape vines hang like cordage from tree to tree, and the azalea sparkles with delicate beauty in the shade, filling the air with its perfume. Near these streams the timber increases in size, as also around the marshy spots, that frequently occur. Here also are found hemlock and holly. Upon the general level ravines are sometimes met with. The land near the head of such ravines has at first a barely perceptible slope. This slope increases from every side until the surface drained extends for miles in every direction. The rush of water after heavy rains, down these ravines, becomes terrific. In course of ages a deep channel is scooped out, and an almost impassible gulf is formed. The sides of these gulfs are clothed with the finest timber wherever the erosion has gone down as far as the underlying limestone. Big Sequatchee Valley, to which reference has already been made, is due more to a great "geanticlinal"* fold than to simple erosion. The crumpling of the earth's crust threw up a fold, which, bursting open on the back, left the softer rocks exposed to the action of weather, and hence the valley.

The Little Sequatchee has also been eroded by the action of water, frost and heat until the bottom is quite a thousand feet below the general surface of the Table-land. The limestone appears a third of the way up to the top, and upon this part of the slope the timber, consisting of poplar, ash, walnut, gum and white oak, is of extraordinary size. It is not uncommon to find poplar trees sixty or eighty feet to the first limb, and six or seven feet through. The finest white ash in the State is to be met with here. The walnut trees are not abundant, but of mammoth propor-

* This with its counterpart "geosynclinal" are terms introduced by Dana to express the bending of the earth's crust and not simply the bending of the strata See Manual of Geology, revised Edition, page 740.

tions. White oaks are common that will measure from four to five feet in diameter. Millions of feet of the very best lumber in this valley await the construction of a railway.

Everywhere, upon the top of the mountain, timber may be found in sufficient quantities to justify the erection of saw-mills. Tanbark from the extensive groves of chestnut oak can be procured in unlimited quantities on top of the mountain, and especially upon the sides and tops of the ridges that make up the upper coal measures. We shall go more into detail as to the locality of such groves when we enter upon a specific description of the Little Sequatchee coal-field.

One other item demands a passing notice. I refer to the sand of which the main conglomerate rock is formed. At many places, especially where the covering of clay and loose sand is several feet thick, this conglomerate rock appears to be loosely cemented. When a blast is made in such loosely aggregated rock, it is resolved into its elements—sand and gravel. This sand, when washed, is dazzling white. It has been tested for the manufacture of plate glass, and found to be exceedingly well adapted to such a purpose. It is mined and shipped to the glass-works at New Albany, Indiana, and is used on the locomotives to increase the friction of the wheels. Here, then, we have the very best quartzose sand near unlimited supplies of coal. Limestone suitable for making lime lies contiguous, and timber for making potash is abundant, so that the essential ingredients for the manufacture of glass are practically inexhaustible. No place can be found on the continent where all the materials for making glass are so abundant, cheap and accessible. The sand can be mined for a few cents per ton. The slack of the coal can be utilized in the furnaces, and the timber and limestone are so common that they have not even a nominal value.

This much generally about the Table-land, all of which

applies to the Little Sequatchee coal region. The whole coal region of Tennessee is but little known. It is a region almost in its primeval wildness, where one may ride for hours without seeing the trace of a human habitation, a region where the wild deer still roams, and where the bear cautiously venturing from his lair at night, makes an occasional descent upon the hog-pens of the settlers, bearing away his prize in safety. Notwithstanding its present wild character, this region is destined to be the theater of great industrial activity, for its natural gifts are such that a people advancing in the arts of peace and civilization, must sooner or later call them to their aid. There is no positive advance in this age without the potential agency of steam, and steam is greatly dependant upon abundant supplies of coal.

In the Little Sequatchee coal-field we shall include the Sewanee mines, at Tracy City; the whole of the coal-field drained by the Little Sequatchee river, and its tributaries 'Peter Cave Fork, Sewanee, Pocket, etc.; also, that drained by the head waters of Collins river, and the mines now worked at the University of the South.

Sewanee Mines. The outcrop of the coal at these mines is 1,922 feet above the sea. The tops of the highest rocks in the vicinity reach an elevation of 2,161 feet. This property consists of 25,000 acres of land, nearly every foot of which is underlaid with coal. The seam worked at present extends over 8,000 acres. A railway 21 miles long belongs to the property, and connects Tracy City with Cowan, a village on the Nashville and Chattanooga Railroad, 87 miles south of Nashville.

The following section taken at that place, and down the Gulf of the Gizzard, will serve to show the number and thickness of the several seams.

SEWANEE SECTION.

Upper Measures; 310 feet.	(13)	Conglomerate; cap rock of the upper plateau, and the uppermost stratum in the region	50 feet.
	(12)	**Coal**	6 inch.
	(11)	*Shale*	23 feet.
	(10)	**Coal,** outcrop	½ foot.
	(9)	*Dark Clayey Shale*	1 foot.
	(8)	*Sandy Shale*	25 feet.
	(7)	Sandstone	86 feet.
	(6)	*Shale,* more or less sandy	45 feet.
	(5)	**Coal,** Main Sewanee, now worked	3 to 7 feet.
	(4)	*Shale,* some of it sandy	42 feet.
	(3)	**Coal,** outcrop	1 foot.
	(2)	*Shale*	5 feet.
	(1)	*Sandstone*	24 feet.
		CONGLOMERATE, mountain covering,	70 feet.
Lower Measures; (*Gizzard Portion;* 290 feet.	(10)	**Coal,** outcrop, (sub-conglomerate)	½ to 1 foot.
	(9)	*Shale,* with clay at top	10 feet.
	(8)	Sandstone, *Cliff Rock,* (*Lower Cong.* of Ætna Mines)	65 feet.
	(7)	**Coal,** outcrop, (Cliff Vein)	½ to 3 feet.
	(6)	*Shale,* with a few inches of indurated clay at top	8 feet.
	(5)	*Sandy Shale*	22 feet.
	(4)	Sandstone, hard	78 feet.
	(3)	**Coal,** (Shale Vein)	1 to 3 feet.
	(2)	*Hard Sandstone,* local	20 feet.
	(1)	*Shale,* including a thin sandstone	20 feet.

The Main Sewanee seam will average about 4½ feet. Its largest development is 10 feet 4 inches, and least 2 feet. Wherever the coal is thickest the superincumbent mountains are low, and the laminæ of the coal are more disturbed. Under the heaviest weight the coal is often very thin. When the weight above is constant, the seam is very regular and unvarying in its thickness. The seam has a general dip to the north-east of about eight feet to the mile.

There are 405 persons employed at these mines, 210 of whom are convicts. A population of 1,800 is supported by the mining operations at this place, and here is found the best market for farm products on the Cumberland moun-

tains. The average day's work for the coal miner is eighty-two bushels of coal. The screenings are made into coke, there being about 4,000 bushels made daily. The company at present has 120 ovens, and the coke is shipped to Alabama, Chattanooga, and other points, and is used in the manufacture of iron, for which purpose it is said to be very superior, owing to its freedom from sulphur and other impurities. The coal is rather singular in its structure, being soft and shelly, with contorted laminæ and a polished shining surface. It is very pure, showing about 65 per cent. of carbon and only about 6 per cent. of ash. As a coking coal it is equal to any in the State.

It is now used for the manufacture of gas at the Insane Asylum, near Nashville, and for more than a year was used at the gas works in Nashville. The manager in a statement made to the company says that by the addition of resin it is equal to the best Pittsburg coal for making gas.

For manufacturing purposes and for grates it is highly esteemed. It is very dry and its specific gravity is below the average. The waste in digging is considerable, but this is used in the manufacture of coke.

Coal (the run of the mines) is delivered at the following price:

To Cowan	per bus.	6½ to	7c.
" Chattanooga	"	9 to	10c.
" Nashville	"		

Coke is delivered at the following rates:

To Cowan	per bus.	5 to 6 c.
" Chattanooga	"	7 c.
" Rising Fawn Furnace, Ala	"	9½c.
" Bawtow Furnace, near Atlanta, Ga.,	"	10c.

The subjoined table shows the amount of coal which has been raised and shipped from these mines since they were first opened in June, 1866. This table is of interest in

showing the regularity of increase in coal production. In 1866 the shipments for seven months, beginning with June were 924 cars; in 1876—for the same months, the shipments amounted to 6,874 cars, each one averaging ten tons.

SHIPMENTS FROM SEWANEE MINES.

Months.	1866	1867	1868	1869	1870	1871	1872	1873	1874	1875	1876
	Cars	Cars	Cars	Cars	Cars	Cars	Cars	Cars	Cars	Cars	Cars
January.....	.....	340	437	408	502	452	866	1204	781	941	1144
February.. ..	.....	268	358	388	367	501	936	1107	719	1,000	1181
March.....	.....	219	434	408	538	362	850	927	646	602	1270
April.....	.....	268	266	243	364	327	795	822	653	913	1022
May.	.....	286	255	119	237	346	646	788	617	580	1120
June.....	68	239	231	110	245	346	495	531	587	557	.....
July	42	201	230	136	225	297	781	564	622	631	.....
August.....	115	208	254	191	179	457	893	857	778	913	.....
September ..	123	406	347	293	302	656	877	1008	849	1,011	.....
October.....	162	369	261	428	546	780	1,054	930	1014	1,287	.....
November ..	189	453	557	462	642	870	1,055	834	1129	1,280	.....
December...	225	368	428	502	564	800	1,004	546	942	1,195	.....
Totals..	924	3625	4085	3688	4711	6194	10,252	9938	9337	10,910	.....

The grand total for ten years is 69,401 cars, or 694,010 tons. Less than 200 acres have been mined. This seam on the company's lands will supply 27,000,000 tons yet before exhaustion, and this without tapping any of the seams of the Lower Measures.

The President of the company in a recent statement uses this language:

"The year just closed was a good year's work, and shows over three and a half millions of bushels of coal mined and shipped. The most gratifying fact connected with this enterprise is that, as the reports show, we have economized this work until we can mine coal and ship it 21 miles, keeping up our improvements and paying interest on the investment, and make money selling coal at about $7\frac{1}{2}$ cents per bushel of 80 pounds. No company in Pennsylvania is doing better than this.

"The value of the coal as a coking coal, as well as for making steam, being now settled, and the quantity of coal being practically inexhaustible, and the railroad of this company being the key to more than 50,000 acres of coal—all of superior quality—far surpassing all the other coal fields of Tennessee, the future growth of this company, and the immense value of the enterprise to the prosperity of Tennessee, are assured facts. By lateral or branch roads, and by opening other mines, the business of the company may be made to the South what the Reading Railroad is to Pennsylvania."

The company has five locomotives and about 149 cars. At the mines a town containing a population of 1200 has been built up. This place, Tracy City, has four or five mercantile establishments, two churches, and good schools. All along the railway to Cowan signs of a vigorous improvement are displayed on every side, and the time is not far distant when this must become one of the most populous, as it is one of the most healthful, portions of the State. Near the junction of this railroad and the Nashville & Chattanooga there is a level expanse bordering one of the tributaries of the Elk, in which the village of Cowan is built. The banks of this stream are limestone, and are sufficiently high for the erection of furnaces. The facility and cheapness with which iron ores of several varieties can be obtained in Georgia and Alabama, as well as in Tennessee, and the cheapness of north bound freight, together with the convenience and cheapness of fuel, render it probable at no distant day that this place may be the seat of extensive iron manufacture.

The Parmelly Bank. On Indian Creek, a tributary of the Little Sequatchee, seven miles a little south of east from Tracy City, is the outcropping of this valuable seam of coal. It belongs to the Cliff Vein of the Lower Coal Measures, which is so persistent over this part of the Tennessee coal-

field. The outcropping here is in two places, one of which is over seven feet thick. This has been worked to a limited extent, and furnishes a very hard, block coal, which, when exposed, resists the action of the weather for years. The seam at this place has not been worked to the bottom. It shows at present nearly five feet, and it has been worked about two feet lower than at present appears. There is but little doubt that the seam, when its full thickness is disclosed, will show eight feet of good, solid coal, free from slate, and almost free from pyrites. The coal is capped by a thick sandstone, and is unquestionably the Cliff Vein. The second outcrop is about fifty yards west of this, immediately under a waterfall which dashes over a cliff of sandstone. A deep basin has been worn out at the foot of the waterfall, and in low water a fine exposure of coal presents itself. The thickness is equal to the outcropping before mentioned. So far as I could perceive the coal is entirely horizontal. These banks are near the Marion and Grundy county line, thirteen and a half miles from Jasper. The country between this bank and Tracy City is characterized by some high ridges belonging to the Upper Coal Measures. Between the ridges the land is flat, and sparsely wooded with white oak, black oak, chestnut, and chestnut oak, with here and there a pine. The soil appears to be above the average of the Table-land in productiveness, and many freshly-planted vineyards and apple orchards are seen about the farm houses. Upon the ridges and slopes the timber is heavier and of a better quality, from which railroad ties could be obtained in any quantity.

Prior's Bank. This lies three miles north of the Parmelly Bank, and outcrops under the cliff sandstone upon the margin of Clear Fork, another tributary of the Little Sequatchee. The outcrop here shows six feet of coal, though the full thickness of the seam does not appear, the bottom being covered with debris. It would doubtless measure eight feet. There can be no question as to the identity of this and the

Parmelly Bank three miles distant. The seam shows perfect horizontality. All the conditions for mining are favorable. The surface features are such as to make the drainage perfect, and an easy grade can be had for a tramway to carry the coal down to the Little Sequatchee Valley. To bring it back by a railroad to Tracy City there would be no difficult grades to overcome. While there are ridges between this bank and Tracy City, there are also low depressures through which a branch railroad may be cheaply constructed.

Green's Bank. This forms another element for the determination of the persistency of the Cliff Vein. The coal here shows itself along the escarpment of the Little Sequatchee Valley for twenty yards or more under a thick sandstone. This bank lies two miles south-east of the latter, and its thickness is fully equal to either of the others just mentioned. This bank has never been worked, but a pit has been sunk in it several feet in depth. The coal is disturbed in appearance, and in its manner of occurrence. This bank overlooks a great heavy timbered forest on the slopes of the Little Sequatchee Valley. Between this and the Prior Bank are some considerable ridges with excellent timber, mainly chestnut and oak.

Caldwell's Mine. This bank is in Marion county, on the opposite side of the Little Sequatchee from those named, ten and three-quarter miles above Jasper. The seam crops out near the confluence of Poor Fork and the Little Sequatchee. It shows a thickness of five feet of excellent coal, hard, lustrous, cubical, and much prized by blacksmiths. It very much resembles the Pittsburg coal in appearance—burns with a bright flame, producing a large amount of coal tar, and would probably serve excellently for the manufacture of gas. At first it was thought that this was the Slate Vein which lies below the Cliff Vein, but more careful investigation leaves but little doubt of its identity with the

latter. It has the same geological horizon, being about 100 feet above the limestone. The cliff does not show itself distinctly here, the debris having accumulated over it from the crumbling of upper conglomerate. There is no appearance of shale about this coal, but the sandstone is abundant. The bank is not sufficiently opened to determine the thickness of the seam with positive certainty. About 100 bushels only have been taken out.

The same seam outcrops two miles below at Harris's, and is five feet thick. The Shale Seam appears near Harris's also, and supplies coal of superior quality, at least such is the report given of it by blacksmiths.

These seams at Caldwell's and Harris's would be more easily accessible by railway than any yet mentioned as being on the Little Sequatchee. A survey made from this point of the valley to Jasper shows nowhere a grade greater than fifty feet per mile. A chute of 400 yards would bring the coal at Caldwell's down to the level of the valley. Two miles above Caldwell's, and thirteen miles above Jasper, 'Peter Cave Fork enters Little Sequatchee from the left bank. This is a wet weather stream, but during the winter months it often rises in fearful floods, sweeping down great boulders over the bottoms, and carrying uprooted trees and drift wood in its course, lodging them in great drifts, so as sometimes to divert permanently the course of the stream. The slopes on both sides of this stream are of extraordinary fertility, and when cleared produce excellent crops of corn and wheat. The timber is very heavy; the trees of poplar, ash, chestnut, buttonwood, beech, and magnolia* or cucumber, stand in all their aged magnificence. The amount of lumber which could be obtained here is almost incalculable.

Near the head of 'Peter Cave Fork, on the right hand side, sixteen and a quarter miles above Jasper, a seam of coal

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*This is the *magnolia acuminata*, and not the *magnolia grandiflora*.

outcrops along the mountain which is, according to my own measurement, eleven feet eleven inches thick. Others have made it still thicker. This seam is perfectly horizontal, with a sandstone covering. Nowhere in the State is there a finer presentation of horizontal coal. The coal has a crushed appearance, very lustrous, with laminæ twisted and curved. It may be a drop from the seam sixty feet above. This extraordinary development of coal is called "The Cliff Vein." It is three hundred feet or more below the top of the mountain. The coal is said to be very superior, and is so much valued by blacksmiths that they come and carry it away on horseback. I saw no appearance of pyrites or slate in it. An incline from this great outcrop, eight hundred feet long, with a perpendicular of three hundred feet, will bring the coal to the level of the valley. From this point to Jasper a careful survey shows a very easy grade, nowhere exceeding fifty feet to the mile. The estimated cost of grading and furnishing cross ties does not exceed $2,200 per mile.

Above this great Cliff Vein, as already intimated, is another Cliff Vein, which shows about four feet of good horizontal coal. The thickness may be even greater than this, and may possibly reach ten or twelve feet. I am disposed to think that this last seam is the true Cliff Vein, while that below has slided down.

Just above these outcrops is a bench of the mountain, slightly inclined, comprising fifteen or twenty acres, covered with good pine, oak, poplar, beech, walnut, ash, and hickory timber; though it is unusual to see many of these growing so near the crest of the mountain. The underbrush consists of grape-vines, calacanthus, fringe tree, etc. The conglomerate cliff is very plainly marked at this point, showing a perpendicular face of sixty or eighty feet. However, there are some pathways by which the top of the mountain may be easily reached. Upon the

main mountain top at this place the surface is quite level, the woods thin, and the wild mountain meadow grass of uncommon luxuriance, which would supply abundant food for thousands of cattle and sheep. Nowhere within sight, though long vistas opened between the scanty timber, could be seen a living thing. It was a solitude as complete as that felt by Selkirk upon the Island of Juan Fernandez. Not a bird winged its flight through the clear atmosphere; no squirrel barked his companionship; no tinkling bell was heard upon the still air; an awful silence brooded over the scene. When looking upon the untrodden grass, emblazoned with myriads of wild flowers, with no stump or mark of the settler's axe upon the trees, with no clearing and no houses, with no sign of domestic animals, it required no effort to imagine this mountain landscape as it appeared before Columbus discovered America. The timber here is scant. A few lonely pines reared their forms above the lowly post oak and white oak. A few blackjacks, with harsh brush, gave variety to the scene. Here is the herdsman's paradise, and the luxuriant grass upon this mountain top, if converted into beef, would feed the entire population of the State of Tennessee.

Descending the mountain and crossing over to the left hand side of 'Peter Cave Fork, we find the same gloomy primitive forest, with luxuriant creepers hanging in graceful festoons from trees more than a hundred and fifty feet in height. The bottoms on the each side of the stream, not more than a hundred yards wide, have been imperfectly cleared by deadening the timber, and slightly scratched to receive the corn. The cultivation of the soil in places is very little better than it received from the red man. After reaching the top of the mountain, heavy ridges are seen superimposed upon the general top. The ridges contain the Sewanee seam, and wherever it has been searched for in its proper geological horizon, it has been found. The first

ridge in going east is two miles or more long, and rises above the general level quite two hundred feet. Its general course is north and south. On the eastern side shale outcrops, and coal has been discovered at one or more places. From the top of this ridge, looking eastward, a deep, valley-like plain appears, one mile across and two hundred feet below, in which are a number of farms. This valley is drained by the waters of Gray's Creek, or Poor Fork. This stream supplies some good water power for grist mills. Near its mouth, two miles below, a large spring bursts out from the side of the mountain in a sufficient volume to run a mill, and sinks after running a short distance. Upon this is Caldwell's mill.

Kelley's Bank. Turning down the valley and crossing over the Kelly ridge, bounding it on the east, which is some half mile wide, we entered a rocky dell bordered by the Kelly ridge on the west and a short ridge on the east, which narrows toward the north until the two come together. A clear little stream, a tributary of Bee branch, which empties into Pocket, and that into Little Sequatchee, flows down the western base of the eastern ridge. At the margin of this stream, a few hundred yards from the head of the gorge, is Kelley's Bank, which outcrops in a seam four and a half feet thick. This seam is capped by twenty feet of black shale, and belongs to the Upper Coal Measures. It is, without doubt, the main Sewanee Vein, as it has the same horizon, but the coal is much harder, the laminæ having none of the crushed or shelly appearance so characteristic of that from the Sewanee mines. The seam is horizontal, and the coal laminated, but the laminæ lie parallel with the seam. The coal is strikingly lustrous, and of excellent quality. This bank is only about two miles from the Caldwell Bank.

Between the Kelley Ridge and the Big Ridge, which overlooks the Big Sequatchee Valley on the east, is a comparative valley fully two miles wide, drained by the waters of

Pocket Creek. The soil of this valley rests, at a greater or less depth, upon the main mountain-covering conglomerate, and is of more than average fertility. Near the banks of the streams the conglomerate comes to the surface, and moderate areas are found not fitted for cultivation. The growth is poplar, chestnut, chestnut oak, and white oak. A few pines are scattered at intervals on the elevated spots. The trees do not stand thick upon the surface, but are of good size. In this valley the range for stock is excellent. Beautiful streams with rapid flow traverse it, all having a general southern course, and all meeting with their waters in the Little Sequatchee. A spot near the centre of this valley was formerly cultivated, but the young timber has sprung up and stands thick upon the ground. This partial opening extends to Pocket Creek, whose general course is southeast. This is a rapid mountain stream which makes, in its descent, a succession of cascades. East of this stream the surface begins to slope upward, and from it begins the building up of Big Ridge, which is four or five miles wide, flat topped, and extends northward for sixty miles. Here is the great development of the coal of the Upper Measures. Big Ridge is the northern prolongation of Huckleberry Ridge, the latter being cut nearly from it by the waters of Bark Camp Branch and Big Creek. The western slope of Big Ridge is well timbered, and the land fertile. Chestnut oak is especially abundant, and tan-bark could be procured here in any desirable quantity. This grove of chestnut oak extends for miles, with a few black and white oaks. The grass is abundant wherever the trees are thin.

Victoria Mines. It has already been stated that the southern prolongation of Big Ridge is called Huckleberry Ridge. On the eastern face of this ridge near the escarpment of the Big Sequatchee Valley, eight miles above Jasper and one and a half miles from Ketchum's, are the Victoria Mines. These mines are now opening. At the

outcrop the coal is 56 inches thick, which increases to about five feet, but squeezes down to 16 inches at the distance of 85 yards. It is capped by a heavy bed of blue shale. The coal is shelly and fragile, and much resembles the Sewanee. Yet it is to be doubted whether it is the Sewanee seam. I am disposed to place it below so as to make it correspond to the lowest coal of the Upper Measures. If it should turn out to be identical with the Sewanee seam, it certainly shows a greater variableness of thicknes at this point than at any other place within the State where it has been worked.

South of the main entry, a quarter of a mile across the ridge is found a hollow, which makes a scallop in the Upper Measures, down which flows one of the small tributaries of the Big Sequatchee. Two other openings have here been made in the same seam. The seam is 20 inches thick, and has six or eight feet of fire-clay beneath. The top is capped at both these places by the same bluish shale as is met with at the first opening. The same seam has been drifted into across another elevation south of the first entry. This also is thin and worthless.

There can be no doubt as to the existance of thick beds of coal in the Upper Measures in this locality. A few miles north is found the Deakins' Bank, where an outcrop of five feet is seen of very excellent coal. At Stone's Bank near the latter a five feet seam also appears. It is found in many places near Griffith's Creek above, also higher up there are many outcrops found on the headwaters of Collins' river, near Kinnaird's, on Still House Branch, and even as far up as Bledsoe county. Near Pikeville, Colvard's Bank of the Sewanee seam is more than six feet thick. More than twenty other openings show the wonderful persistency of this bed, and it is thought to extend even as high up as Pennsylvania, and to be identical with coal B of Lesley. By all odds the Sewanee seam is the most valuable, as it is the most certain in its yield of any in the State.

Returning to Tracy City by the way of Kelly's and Bryant's, many indications of coal beds are seen on Gray's Creek, also on the Lane Mill road, where it descends into Little Sequatchee Vallley.

Turning our attention now to the region of country lying immediatly north and northeast of Tracy City, as far as the Sequatchee county line, we shall find many objects of special interest. In this part of the Table-land the Upper Coal Measures increase in thickness, and the farming areas are larger, and the timber better. The face of the country is generally more uneven. Long, swelling slopes, high ridges and low depressions with numerous streams are the leading features. The tops of the hills are generally, but not always, thinly wooded, but the slopes are usually well covered with the charcteristic growth of the mountain. Everywhere timber for making railroad ties is abundant, and groves of pine occur, and in many places thousands of hoop poles can be found in a limited area.

After leaving Tracy City, going northeast, the upper plateau extends for two miles when it is cut in two by Holy Water, which runs east and empties into Little Sequatchee river a short distance northeast of Tracy City. Holly Fork, a tributary of the latter stream, runs south and empties into Holy Water at the head of Sewanee Gulf. Between these two streams the country is high and rolling, with many shallow ravines penetrating it towards both streams. These ravines answer an admirable purpose in giving exposures to the coal, and this remark is applicable to almost the entire coal-field of Tennessee.

Four miles northeast of Tracy City is Chestnut Oak Ridge, which rises up to an equal altitude with the coal-bearing ridges about Tracy City. This ridge is about half a mile wide and quite three miles long. Its course is east and west, and in addition to the vast amount of coal which lies embosomed beneath its surface, it can supply an almost un-

limited quantity of tan bark. The surface is thickly set with chestnut oak, whose value as a tanbark tree is not equaled by any other in our forests.

Passing in a northerly direction over this ridge, we enter a pocket or cove which looks out eastward. Ridges encircle it on the south, west and north, flattening down on the northeast side. This cove contains probably two square miles, and is drained eastwardly into the Little Sequatchee Gulf. It has been eroded down to the main conglomerate of the Table-land, and has a surface nearly level, but it is thinly wooded.

On the northeast side of this pocket, and directly north of the head of the Little Sequatchee Gulf, the Upper Measures disappear for a considerable distance. The country becomes flat, presenting some good farming lands. The timber also improves in quality. It may be said, generally, that wherever the Upper Coal Measures are absent the country is more level and probably better adapted to agricultural purposes. On the breaks of the hills that point toward the head of the Little Sequatchee, magnificent highway pasturage is found, where the wild grasses flourish in princely luxuriance.

At the distance of nine miles in a northeasterly direction from Tracy City, a great forest of yellow pine begins and continues northward for four miles, and eastward for fifteen miles. This pine region lies on both sides of the Chattanooga and Altamont road. The timber is very abundant and very valuable. More than one hundred trees, from two to three feet in diameter, that will furnish from three to four twelve-foot cuts each, may be found on a single acre.

The Swiss Colony. In this extensive pinery, about seventy-five families of native Swiss have settled. About 10,000 acres are included in the colony lands, and the success which the colony has met with in the cultivation of the mountain soil is the best evidence that can be given of its

value. Beginning without means, for a time the difficulties in the way of the colonists seemed insurmountable. They had neither utensils nor work-stock, and the cultivation of the farms was done by hand for several years. By industry and the practice of that rigid economy, which is unknown to the native American, they have managed to stock their places. The region which six years ago was bleak, desolate and uninhabited, now shows the signs of a thrifty population. A small village, Gruetli, has sprung up. The former fruitless wilderness is crowned with orchards and gardens, with meadows and rich fields of clover, rye, and even wheat. Herd's grass and orchard grass grow with surprising fecundity when the character of the soil is considered. The yield of rye is 18½ bushels per acre; wheat 10 to 12 bushels; Indian corn under the best cultivation, 20 bushels. Irish potatoes make an average return of seven bushels to one planted. Some richly manured fields yield as much as twenty to one. Oats make a better return than any of the grain crops, the yield being about 38 bushels per acre. Tobacco of fine fibre and mild flavor is grown for home consumption. Millet is grown with profit, a yield of three large two-horse loads having been taken from half acre in one instance. Farmers do their own work. Oxen are used instead of horses on the farm. There is an average of about two cows to each family in the colony. Butter and cheese are exported in limited quantities. About 2000 pounds of the former and 1000 of the latter having been made during the past year. Six hundred gallons of wine were made from the nine acres of vineyard. About seventy-five acres have been planted in apple trees, and the colonists expect to derive the largest revenue from this source. There is one school having 109 scholars enrolled, sixty-five in regular attendance. A portion of these lands has been set apart for school purposes. Two saw mills are kept employed. Lumber sells at $12 per

thousand. An establishment for making wagons is carried on, which turns out one wagon complete each month. A blacksmith shop is carried on in connection with it, also a paint shop. The saw mills have grist mills in connection, all run by water power supplied by the head branches of Collins' river.

There are two or three outcrops of coal on the lands belonging to the colonists, which show from two to two and a half feet of good coal. Very little of it is used at present, however.

The colony is now out of debt, and is growing in prosperity every year. The houses are neat and tasteful, and the yards are ornamented by evergreens and flowers. It would be difficult to find in any part of the State a community that has made more rapid advances within the same time than this colony. They have all the means of living within themselves. What they have done without money or assistance is an earnest of what may be done with these mountain lands by the application of capital and intelligent labor.

Coal of Little Mountain. The colony's lands lie five or six miles east of Altamont. Five miles east of the colony is seen a high ridge running northeast and southwest, and extending, with a few interruptions, southward to Tracy City, and northward to Cumberland county. It is known in the locality east of the colony as Little Mountain. Its entire length, reckoning from Tracy City to Cumberland county, is not less than sixty miles. This is unquestionably the great coal-field of Tennessee. The Upper Measures, as well as the Lower ones here, reach their greatest development.

We propose to give a detailed description of this part of the coal-field eastward, including a small part of Sequatchee county; and then southward to a point near the great Cliff Vein on 'Peter Cave Fork spoken of heretofore. This

will complete an entire survey of this region east and north of Tracy City.

At the western base of Little Mountain is a large area on both sides of the Altamont and Chattanooga road that is comparatively flat and well set in timber, mostly white oak, red oak and chesnut. In the low swamp-like flats, the red flowering maple prevails. This region supplies as fine grazing grounds as can be found any where, the surface being clothed with a rank, rich herbage. In appearance this area looks like a wide river bottom, extending for several miles up and down the western side of Little Mountain, being about two miles wide. The absence of undergrowth is noticeable. The practice of setting the leaves on fire in early spring kills out all the small bushes and undergrowth.

There is an offset here to Little Mountain and a notch which runs southward from the Altamont and Chattanooga road, forming Kinnaird's Cove. From this cove flows Woodley's creek, a tributary of Walter's creek, which empties into Collins' river. On the east side of Woodley's creek, Little Mountain rises to a still greater height, but on the west side it melts down on a level with the plain. Outcropping along the margin of Woodley's creek is the Sewanee seam, where it is seen in four or five places nearly on a level with the water. The seam here is from three to four feet thick, and shows coal very hard, heavy, intensely black, and of a glistening lustre.

On a tributary of Woodley's creek known as Still House creek, one mile from the Sequatchee county line is Barker's Bank. The coal here is from three to four feet thick, and is of the same quality as that already spoken of. All the coal outcrops in this locality are capped by a thick bed of bluish shale, and evidently belong to the Sewanee seam.

Above the Sewanee seam, 50 feet, appears at this place another seam that is workable. This is seen on the farm of A. L. Deakins, three miles from the Barker Bank, and

is about two feet thick. Four miles east of Deakins' in Sequatchee county, and seven miles southwest of Dunlap, occurs the great Deakins' bank. This is 4 feet 8 inches thick at the outcrop, and increases to 4 feet 10 inches at the distance of twenty feet. This coal is hard and block. Overlying the coal is a stratum of bluish shale 12 feet thick. This outcrop belongs to the Sewanee vein. The bank has been opened directly on Hicks' branch, a small stream that flows southward into Pickett's creek, a tributary of the Big Sequatchee. The stream has cut a gorge in the Upper Coal Measures nearly down to the level of the conglomerate rock. This gorge is three miles long and a half mile wide and the coal is seen about one mile from the head. The tongue of land between this gorge and the Big Sequatchee Valley is two miles wide at this point.

One mile south-east of the bank described, on a branch of Hicks's Creek, is Stone's Bank, which is separated from Deakins' by a little tongue of land. This is no doubt the same seam. It is said to be six feet thick, though at the time of my visit the dirt had fallen in so that the thickness could not be measured with exactness. Both this and the Deakins' Bank show horizontal seams with a capping of slate. The coal from both banks has an excellent local reputation.

Returning now to Kinnard's Cove, which has a northern outlet, and in which Woodley's Creek takes its rise, we find a farming country of more than average fertility. The timber in this cove is heavy, and of the most valuable species. Going to the southern extremity of the cove and climbing the Upper Coal Measures, which are here between four and five hundred feet in thickness, a flat, level table-land extends southward, eastward, and westward for many miles. The top of this second mountain resembles, in almost every particular, the main top of the Table-land. The timber is some larger and thicker, and consists of a greater

quantity of chestnut oak and chestnut, with fewer red oaks and white oaks. The wild grasses are not so abundant, though the soil appears to be deeper, fewer rocks coming to the surface.

A dull, unvarying landscape extends from the head of the cove southward four miles, where it is interrupted by a deep cove looking out westward, and known as Bear Pen Cove. Crossing this cove the same high plateau continues southward beyond Victoria Mines and Tracy City, the southern part being denuded by the gulfs of the Little Sequatchee river and its tributaries. Near Bear Pen Cove begin some of the gorges made by the head streams of 'Peter Cave Fork, upon which, as the reader will remember, the Big Cliff Vein of the Lower Measures appears. Between Bear Pen Cove and the Big Cliff Vein, about two miles northeast of the latter, are the 'Possum Abe Banks. There are three of these all in the Sewanee seam, and showing, as is said, four feet of good coal, though the openings had fallen in at the time of my visit. From Deakins' Bank to the 'Possum Abe Banks, a distance of ten or twelve miles, there is no interruption of the Upper Measures. Whenever the coal outcrops it shows a thick seam. Outlets for it may be made either by the Big Sequatchee or Little Sequatchee Valley, or by the way of Tracy City. A large presentation of coal is found near Payne's Cove, north-west of Tracy City.

It may be well to mention here that there is a region of country lying immediately south and west of Tracy City extending to the Alabama line, and included in the counties of Marion and Franklin, which contains quite a large amount of excellent coal. Nearly all, however, pertains to the Lower Measures. The Upper Measures are met with only in one or two knolls. Two miles west of Tracy City is what is called Thompson's bank, which belongs to the Upper Measures. The "Lower Mines," about ten miles west of Tracy City, on the railroad, was worked for a con-

siderable time by the Sewanee Company. The bed here averaged three feet, and the coal taken out was hard and cubical, unlike the coal of Tracy City. About thirty-two feet below this seam another occurs which gives from one and a half to two feet of good coal. This lower seam of the Upper Measures was worked one mile and a half below the Lower Mines for some time.

Near Moffat, a thriving little village six miles west of Tracy City, on the line between Grundy and Marion counties, some coal has been taken out of the Lower Measure for local purposes. It is a free burning coal, and well suited for grates. Moffat is distinguished for its excellent institution of learning for young ladies, and also for the magnificence of the mountain scenery and pure freestone and chalybeate waters. Some seventy or eighty acres around the village have been planted in orchards. A few manufacturing establishments have been started, and it bids fair to rival any town on the mountain. It is settled mainly by persons who have come to the State since the war.

The most interesting developments of coal in this field west and south of Tracy City, are met with upon the lands belonging to the University of the South. This University is situated upon the escarpment of the mountain plateau in Franklin county. Many beautiful landscapes are seen from points in the vicinity. The institution is in quite a flourishing condition, from three to four hundred students being in regular attendance. The village contains a resident population of two hundred or more. This population is noted for its refinement and culture, and is composed of persons who have sought the place for its educational advantages.

Two coal mines are opened at this place, both belonging to the University. One of these, leased for a term of years by P. Gillam, lies east of the University. The seam worked here is the Cliff Vein, which has not developed a thickness exceeding twenty inches. The coal is very hard, but diffi-

cult to mine. The lessee, at the time of my visit, was prospecting for the lower Shale Vein. The Cliff Vein at this place is about sixty feet above the limestone. About two thousand bushels are annually mined at this place for local consumption. The coal is brought up an incline to the top of the mountain by horse power with a windlass.

Another mine has been opened one and a half miles northwest of the University, and is now worked by H. H. Roberts. This seam, which is the Shale Vein, lies one hundred and sixty-nine feet below the bottom of the conglomerate, which here thins down to a feather edge. The seam is only eighteen feet above the limestone, which shows a decrease in the series of strata comprising the Lower Measures as compared with the same in the Tracy City section of over one hundred feet, or one-third of the whole. The seam is capped by sandy shales and sandstones. The shale beneath the coal is so indurated that it is nearly as hard as limestone. The thickness of the coal at this point is about thirty inches. At one or two places it swells out to forty-two inches. There is found nowhere in the State a coal superior to this as a grate coal. It is a free burning coal, very hard and cubical. It resembles the best Pittsburg coal. It is deep black and shiny and shows a beautifully laminated appearance. It will weather almost as well as a limestone rock, owing to its freedom from iron pyrite. For transportation on railroads to distant markets, or for use on steam vessels, there is none superior to it anywhere. It is probably also a good gas coal. It leaves, as a residuum, a white ash. About thirty thousand bushels are taken out annually, a large portion of which is consumed at the University, some twelve or fifteen cars only being shipped to Fayetteville and other points. The demand for this coal is continually increasing.

The Slate Vein is noted for the excellence of its coal. Wherever it has been opened, whether in White, Grundy, Franklin, or Marion, the character of the coal is the same.

Above this are two, probably three, other seams. The following is a section at this point approximately correct:

Lower Measures.

10. Conglomerate feather edge.
9. Shale, with probably a thin seam of coal..40 feet.
8. Cliff Sandstone ....74 feet.
7. Coal.....10 inches.
6. Fire Clay..... 1 foot.
5. Shale..... 3 feet.
4. Coal (?).....
3. Sandy Shales .....50 feet.
2. Coal, Roberts' Banks.....30 inches.
1. Shale and Sandstone.....18 feet.

Limestone, gray .....

Coal, 7, shows itself under a waterfall.

An attempt is now making by Mr. Caldwell to open the Shale Vein two miles east of Tantallon, on the Nashville and Chattanooga Railroad. It shows in the debris on the side of the mountain from three to four feet thick, but it has evidently been dropped from above. Should this coal be found in workable quantities, it will prove very profitable, as the means of transportation here are very largely increased. In Lost Cove, between Tantallon and the University, Amos Garner has recently opened the Shale Vein and taken out twenty bushels or more of excellent coal. The seam promises well. South of this, coal is also mined to some extent. The thickness of the seam varies from fifteen to twenty-five inches.

Still further south, in the Valley of Crow Creek, the Cliff Vein shows a thickness of three feet. The coal at this point has thin seams of mineral charcoal. The Shale Vein, ninety-four feet below, has a thickness of two and a half or three feet. The Lower Measures at this point resemble the Lower Measures of the Sewanee Section, as they appear in the gulf of the Fiery Gizzard.

The region of Battle Creek and Ætna Mines lie south and south-east of the Little Sequatchee Coal-field. The Upper Measures do not appear at Battle Creek Mines, but

show a thickness south of the Tennessee river at the Ætna Mines of two hundred and twenty feet. A full account of Battle Creek and Ætna Mines may be found in the Geology of Tennessee, by Safford, and in the "Resources of Tennessee."

The eminent advantages offered by Cowan for the location of furnaces have already been mentioned. The same advantages also pertain to Big Sequatchee Valley. On the eastern side of this valley the fossiliferous red hematite, or dyestone ore, appears regularly stratified. This stratum or layer crops out about sixty feet above the valley. It begins at Amos Lewis', four and a half miles above Jasper the terminus of the Bridgeport and Jasper branch of the Nashville and Chattanooga railroad. From this place it may be traced northward for twenty-eight or thirty miles. It is often cut by ravines so as to permit the easy construction of tramways or railroads. Up these ravines it appears on both sides, as well as in the main mountain mass, which here takes the name of Walden's Ridge. Indeed, each one of these ravines forms a *cul-de-sac* with an encircling red band of iron ore.

Above the farm of A. P. Mitchell the stratum is composed of three or more ledges, and appears near the crest of a ridge, which is eight hundred yards wide and fourteen miles long. This ridge runs parallel with the valley, and is two hundred feet high. The ore dips slightly toward the mountain, the stratum being nearly as low where it enters Walden's Ridge as the valley proper. Above the northern end of this iron ridge there is a line of knobs, or rather a dissected ridge, in which fossil ore abounds. The thickness of the outcrops is variable On the hill above Mitchell's house, nine miles above Jasper, the seam shows a thickness of four feet. Nearer the base of the mountain is Laurel Hill, at the foot of which flows Laurel Branch, a stream which dries up during the summer months. On both sides

of this stream the presentation is very fine. At many places the ore shows solid ledges six feet thick. There appears to be a second seam below this, but in all probability it is a slide from the one above. The strata all dip slightly to the south-east. A section at this place shows,

7. Lower Coal Measures, thin.
6. Mountain Limestone.....200 feet.
5. Siliceous Group..... 50 feet.
4. Black Shale (Devonian). ..... 30 feet.
3. Limestone, Upper Silurian..... 20 feet.
2. Iron ore.....4 to 6 feet.
1. Limestone, Upper Silurian.....

In addition to the red fossil ore found on the eastern side of this valley, there occurs all over the Cumberland Table-land a limonite freshly deposited from chalybeate springs; also immense deposits of clay iron-stone and black band. All these ores could be made valuable by being worked with richer but more refractory ores.

A railroad twenty miles long, built down the Little Sequatchee Valley to within two miles of Jasper, then turning north-easterly, crossing the Big Sequatchee near the mouth of the Little Sequatchee, would unite the thickest coal bed and the thickest stratified iron bed in the State, while the banks of the Big Sequatchee lying between the two would give the very best sites for the erection of blast furnaces. At no place on the line of such a railroad would the grade exceed fifty feet to the mile.

Sequatchee Valley is blessed with a fertile soil and a healthful climate. It is a valley teeming with the richest productions of forest and field, from which are sent out annually immense droves of hogs and cattle, as well as great quantities of grain. Abundant supplies could be had for furnaces from this valley at cheap rates.